19) Federal Republic of Germany

German Patent Office

(11) Unexamined Patent Application 27 34 522

(51) Int. Cl.[2]: G 02 B 5/14

(21) Registration No.: P 27 34 522.8

(22) Filing Date: July 30, 1977

(43) Disclosure Date: February 15, 1979

(54) Optical Radiation Protection

(71) Applicant: Robert Bosch GmbH, 7000 Stuttgart

(72) Inventor: Christian Timmermann, Eschollbrucken; Heinz Reisinger, 6100 Darmstadt

Claims

1. Optical protection device for an optical connector in glass fiber transmission lines, characterized by the fact that the protection device is arranged to automatically act on the light-guiding side of the connector.

2. Optical protection device according to Claim 1, characterized by the fact that two plug pins (2, 14) provided with central light guides (1, 15) can be guided in a common bushing (3) on a part of their length, that the bushing (3) is arranged in a coupling housing (5), that one of the two plug pins is arranged to be plugged in the axial direction, and that at least one optical closure device (8) is arranged in the connection path of the last named plug pin (14) within coupling housing (5).

3. Optical protection device according to Claim 1 or 2, characterized by the fact that several identical closure devices (8) are arranged in the coupling housings (5), one behind the other, with a spacing

4. Optical protection device according to one of Claims 1 to 3, characterized by the fact that closure device (8) consists of at least one elastic disk having several slits (9) passing through the flat center.

5. Optical protection device according to one of the preceding claims, characterized by the fact that the bushing is slit in the region of the releasable plug pin (14).

6. Optical protection device according to one of Claims 1 to 5, characterized by the fact that the outside diameter of the releasable plug pin is elastically variable in the region of cooperation with bushing (5) [sic; (3)].

7. Optical protection device according to one of Claims 1 to 6, characterized by the fact that a releasable plug pin (14) as a guide piece (17) is arranged to slide directly in coupling housing (5).

8. Optical protection device according to one of Claims 1 to 7, characterized by the fact that coupling housing (5) has an outside thread over which a sleeve nut can be screwed.

9. Optical protection device according to one of Claims 1 to 8, characterized by the fact that the sleeve nut engages behind the guide piece (17) of the releasable plug pin (14).

Optical Radiation Protection

Summary

Optical radiation protection that can be applied in releasable connections in a glass fiber transmission line is proposed. The radiating end of the connection, for example, can be the end of a plug or transmitting diode. This end is protected by a flexible cover in the decoupled state. The cover acts as radiation protection for the human eye during handling of the coupling arrangement. During coupling of the two fiber ends, it is deformed so that the two fiber ends can be optically coupled to each other.

Prior Art

The invention starts with an optical protection device according to the generic features of the main claim. Optical coupling arrangements for individual light guides have recently become known in a large number. For example, a coupling for light guide conductors is known from German Utility Model 75 35 713, whose task is to guide the light guide conductors concentrically and connect them to each other, protected against longitudinal displacement. In this known coupling arrangement and others known to the applicant, however, the radiating end of one light guide is unprotected after separation of the connection so that there is a hazard that the user of the coupling arrangement will look directly into the freely radiating end of the glass fiber. This hazard is particularly great at the output connector of a transmitting diode unit with lasers or LEDs as the light source, because the light would scarcely be attenuated in the short feed piece to the light source. In the case of signal transmission with light-emitting diodes or laser light, a radiation hazard to the human eye can occur because, during transmission of light from an LED light source with glass fibers at a spacing of about 15 cm and in the case of the transmission of light of a GaAlAs laser at about 1 m, the radiation density of 5 $\mu W/cm^2$ admissible in the eye is reached. During transmission with infrared light in particular, a very hazardous circumstance is added to this in that the radiation is invisible and the threat cannot be recognized.

Advantages of the Invention

The radiation protection according to the invention with the characterizing features of the main claim, on the other hand, has the advantage that the radiation emerging from at least one glass fiber end is trapped (attenuated) in the opened state of the connector by means of an automatically acting closure device. An additional advantage is seen in the fact that the closure is simple and inexpensive to manufacture and can be applied so that it cannot be opened from the outside without authorization.

Through the expedients listed in the dependent claims, advantageous modifications and improvements of the optical protection device mentioned in the main claim are possible. It is particularly advantageous that several closure devices can be arranged axially one behind the other to increase the safety level.

Drawings

A practical example of the invention is shown using the example of a glass fiber connector in the drawings by means of several figures, and further explained in the following description.

Figure 1 schematically depicts, in a cross section, the decoupled glass fiber transmission line,

Figure 2 shows the same arrangement with the connected glass fiber transmission line,

Figure 3 shows a cross section through the coupling arrangement along line A in Figure 1.

Description of the Invention

The radiating end of the glass fiber 1 is attached centrally in a plug pin 2 in Figure 1 so that the two end surfaces lie in one plane. The plug pin 2 is fastened in a bushing 3 so that the bushing 3 protrudes beyond the end surface 4 of the plug pin 2. The bushing 3 is fastened in the coupling housing 5. The coupling housing 5 has a step-like hole 6. At a stipulated distance from the end surface of the bushing 3, the hole 6 widens to form a shoulder 7. The protection device 8, here in the form of a cross-slit rubber disk, is positioned on the shoulder 7 and fastened into the coupling housing 5 by gluing. The rubber disk 8 according to Figure 3 has several cross slits 9 that intersect in the center of a circle.

The optical coupling arrangement contains an additional light guide 15 attached centrally to move in plug pin 14 so that the end surfaces of plug pin 14 and light guide 15 form a surface 16. The plug pin 14 according to Figure 2 is enclosed by a guide bushing 17 that permits the two ends of the light guide transmission line to be centrally guided in the coupling house 5 during coupling.

Figure 2 shows the coupling arrangement according to Figure 1 in the coupled state of the glass fiber transmission line. It contains the same parts as the arrangement according to Figure 1, so that identical reference numbers are used to mark the individual parts. As is apparent, the end surface 16 of plug pin 14, on approaching plug pin 2, initially strikes against the protection device 8, which causes the tabs 10 (Figure 3) formed by the cross-shaped indentations 9 to expand elastically and lie against the outer surface of the plug pin 14. The hole 6 widened relative to the bushing diameter of bushing 3 then serves to accommodate the bent tabs 10 of the